AFOSR Special Announcement

BAA No. AFOSR 2001-5

AFOSR 2001 THEME - BIO-INSPIRED CONCEPTS

I. INTRODUCTION

The Air Force Office of Scientific Research (AFOSR) announces a fiscal year 2001 competition for research as Theme - Bio-Inspired Concepts.

II. PROGRAM GOALS

THEME – BIO-INSPIRED CONCEPTS

Background: The creative energies of humankind have long been inspired by the amazing capabilities of biological systems. Many revolutionary achievements in engineering and science have their genesis in the observation and mimicry of living organisms. These advances have been achieved primarily through the long process of trial and error, rather than through a fundamental understanding of the form and function of biological systems. Recent dramatic developments in biotechnology and the chemical and materials sciences have given unparalleled access to biological systems at the molecular level. This, in turn, has provided an opportunity to uncover the rules governing the design and function of biomolecular structures. Scientists may now begin to probe such questions as, what governs the assembly of bio-molecules into complex three-dimensional structures? What determines the basis of the stimulus, transduction, and response process at the molecular level? What determines the flow and transformation of chemical energy in biological systems? What are the principles for communication and control between biomolecular structures? What laws dictate the relationships between structure and function? Answers to these questions will require integrating biological research with other disciplines, such as chemistry, physics, mathematics, materials science, and engineering. The complexity and difficulty of this basic research theme are significant, but so, in turn, are the potential payoffs to the Air Force.

Objective: The specific goal of this research theme is to build a fundamental scientific basis for implementation of bio-inspiration to areas of interest to the Air Force and the DoD. Research carried out under this theme will be directed towards the fundamental understanding of the rules and principles that govern the function, structure, and operation of biologically-based organisms, cells, and molecules. Furthermore, research under this theme will investigate the application of these fundamental rules and principles to the development of bio-inspired systems, materials, processes, and strategies to achieve revolutionary advances in future Air Force systems.

Research Concentration Areas: Research under this theme will fall into one or more of the following topic areas.

- Sensing, Stimulation, and Signal Transduction: Investigate the physics, chemistry, and biology underlying the biomolecular (genomic, proteomic and/or metabolomic) response of cells to internal and external electromagnetic, chemical, magnetic, thermal, and/or mechanical stimuli. Capture the resultant experimental understanding in predictive analytic/computational models. Understand and apply these underlying design principles in the development of bio-inspired sensing systems. Examples include the study of biological transducers and neural systems that derive information for object recognition, navigation, prey capture, or prey avoidance.

- Structures and Materials: Study the structural and chemical design principles employed by biological systems, and/or the use of bio-inspired substances, to generate materials and surface structures with new properties, architectures, or functionalities. Areas could include unique biomaterials, polymeric systems, composites, inorganics, hybrids, electronics, and sensing.

- Energy Storage and Conversion: Investigate the fundamental design principles and molecular organization of bio-energy systems for the development of super efficient energy dense compact power systems. Areas could include bio-inspired electrochemical structures, membranes and separators, catalysts, and storage systems.

- Actuation: Employ bio-inspired principles and materials for use in actuation and manipulation of systems and structures. Areas could include optically adaptive structures, shape memory polymers, electroactive polymers, and artificial muscles.

- Guidance and Control: Study the foundations of biological guidance and control systems for navigation, swarming, autonomous flight, communication, and threat avoidance. Examples include sensorimotor systems applicable to miniaturized flight, and multi-sensory interactions that maintain body orientation and regulate movement with respect to gravitational or electromagnetic fields.

Impact: Research carried out under the Bio-Inspired Theme will help usher in revolutionary new technologies that will fundamentally change the way future Air Force weapon systems are designed and implemented. This research effort will endeavor to identify biological mechanisms, structures, and systems with the potential to inspire future technology in all Air Force systems. Understanding these mechanisms, structures and systems at a fundamental level will accelerate advances in energy technology, control of complex systems, sensors, and materials engineering.

Theme Coordinator: Dr. Walt Kozumbo, AFOSR/NL, walter.kozumbo@afosr.af.mil, (Biological Response to Chemical and Physical Agents, Biomolecular Profiling, Predictive Toxicology, Biocatalysis) Theme Program Managers: Dr. Robert J. Barker, AFOSR/NE, robert.barker@afosr.af.mil, (Plasma Physics and Pulsed Power); Dr. Robert Cohn, AFOSR/NL, robert.cohn@afosr.af.mil, (Biomimetics, Biosensors, Biomaterials, Biochromatics, Adaptive Structures, Autonomous Flight); Dr. Marc Jacobs, AFOSR/NM, marc.jacobs@afosr.af.mil, (Guidance and Control, Dynamical Systems, Actuation); Dr. Willard Larkin, AFOSR/NL, willard.larkin@afosr.af.mil, (Sensory Neurobiology, Sensorimotor Control); Dr. Charles Lee, AFOSR/NL, charles.lee@afosr.af.mil, (Polymeric and Organic Structure and Materials); Lt. Col. Paul C. Trulove, AFOSR/NL, paul.trulove@afosr.af.mil, (Surface Structure, Materials, Compact Power, Sensing).

III. CONDITIONS

To receive consideration for funding this fiscal year, proposals should be received at AFOSR by 3:00 PM EST, 15 June 2001. Questions regarding technical aspects of the theme can be directed to any of the participating program managers. Proposals must be submitted to the Theme Coordinator identified in Part II at the following address:

Air Force Office of Scientific Research
801 North Randolph Street Rm 732
Arlington VA 22203-1977

Target award date for awards is 1 September 2001 for proposals received by 15 June 2001. The Government reserves the right to select for award, all, some or none of the proposals received.

Cost sharing is encouraged but not required.

Proposals may not be submitted by fax or e-mail; any so sent will be disregarded.

IV. PROPOSALS

A. Submitting proposals

Proposals should be no longer than 30 pages (excluding cover and budget sheets and *c.v.* of investigators). An original and five (5) copies of the proposal are required. Proposals may also be submitted by electronic media (floppy disk, zip disk or CD-ROM in MS Word or Portable Document File (PDF) format). Sections IV B & C contain instructions for submitting proposals. Proposals will be evaluated using the criteria set forth in Section IV D.

B. Format and Technical Content Proposals

Each proposal should be typed single sided in 10 or 12-point type, double-spaced, on 8 1/2 X 11 inch white paper, bound or stapled to keep documents intact and allow convenient handling. Attachments, such as institutional brochures or reprints, will not be considered in the evaluation or selection process.

The proposed objective should be the performance of research in support of the program goals delineated in Section II. For this reason, proposals must adequately describe the proposed research (including current state-of-the-art, recent contributions of the proposer, intended technical approach and expected results) objectives, approach and expected outcomes. This information will allow evaluation of prospective research quality and relevance.

1. Cover Page. To be eligible for consideration, each copy of the proposal should bear as a cover page provided in Appendix A (or a photocopy thereof). The original proposal and each copy must include these pages.

2. Abstract. The abstract of the proposal should be no more than one page long.

3. Text. The technical portion of the proposal must contain the following:

a. A conceptual outline of research goals and proposed scientific approaches identifying novel or innovative features.

b. Describe in detail the research to be undertaken. State the objectives, approach and relationship to the current state of knowledge. Include an appropriate bibliography and list of literature citations. Summarize the expected research results and significance as well as the expected contribution toward meeting the objectives of the program outlined in Section II.

c. Estimate the time that each principal investigator and other senior professional personnel will devote to the research. For research teams describe the task breakdown and research responsibilities of each constituent unit.

d. Describe facilities available for performing the proposed research and any additional facilities or equipment proposed for acquisition.

4. Curriculum Vitae. Furnish brief vitae for key research personnel, including senior investigators. Provide biographical sketches and list relevant publications. *Vita* should be limited

to two pages for each investigator. List names and titles of other scientific or technical personnel who will be directly associated with the project.

C. Financial Content of Proposal

The financial portion of the proposal must contain a cost estimate for the proposed effort including a description of cost sharing arrangements, if any. It is anticipated that the awards will have a performance period of thirty-six months. For evaluation purposes budgets should be for each twelve month period. Assume a 1 September 2001 start date. AFOSR will make payment to educational and non-profit recipients based upon a predetermined payment schedule. Payments will normally be made quarterly in advance of performance, based upon a spending profile that must be provided as part of the proposal. Payments should be limited to the amounts needed to conduct research during each respective period. Educational and non-profit organizations shall submit a spending profile with their cost proposal. For further details, proposers should refer to the "Proposer's Guide to AFOSR Research Programs" (see Section V J for availability).

D. Evaluation and Selection of Proposals

Proposals will be evaluated under the following two primary criteria, of equal importance, as follows:

1. The scientific and technical merits of the proposed research in the context of the objectives of the themes.

2. The potential contributions of the proposed research to the mission of the USAF.

Other evaluation criteria used in the technical reviews, which are of lesser importance than the primary criteria and of equal importance to each other, are:

1. The likelihood of the proposed effort to develop new research capabilities and broaden the research base in support of US national defense.

2. Qualifications, capabilities and related experience of key personnel, facilities, or techniques or a combination of these factors that is integral to achieving USAF objectives.

3. The proposer's and associated personnel's record of past performance.

4. The realism and reasonableness of proposed costs.

No further evaluation criteria will be used in source selection. The technical and cost information will be analyzed simultaneously during the evaluation process. The US Government does not guarantee an award in each topic area. Further, be advised that, because funds are limited, otherwise meritorious proposals may not be funded. Therefore, it is important that proposals show strength in as many of the evaluation areas as practicable for maximum competitiveness.

E. Awards

Subject to the availability of funds and selection of adequate proposals, AFOSR will award grants, cooperative agreements or contracts likely not to exceed $125K per year. It is anticipated

that the awards will have a performance period of thirty-six months. Negotiations may reduce funding of the awards to an amount lower than that proposed.

V. ADDITIONAL INFORMATION

A. The cost of proposal preparation in response to this Announcement is not considered an allowable direct charge to any resulting award. Such cost is, however, an allowable expense to the normal bid and proposal indirect cost specified in FAR 31.205-18, or OMB Circular A-21, Cost Principles for Educational Institutions or OMB Circular A-122, Cost Principles for Nonprofit Organizations.

B. Every effort will be made to protect the confidentiality of the proposal and any evaluations. The proposer must mark the proposal with a protective legend in accordance with FAR part 15.6, Use and Disclosure of Data, if protection is desired for proprietary or confidential information.

C. Proposals should briefly address whether the intended research will result in environmental impacts outside the laboratory, and how the proposer will ensure compliance with environmental statutes and regulations.

D. Technology sharing and transfer is encouraged; in this respect, AFOSR welcomes proposals that envision university-industry cooperation. Nonindustry proposers are encouraged to specify in their proposals their interactions with industry and the Air Force Research Laboratory's Technical Directorates, including specific points of contact. Cooperation with or use of facilities of the Air Force Research Laboratory is also encouraged, but not a necessity. Personnel interaction (e.g., university faculty or students performing research at industry or Air Force Research Laboratory sites; industry or Air Force staff working in university laboratories) is viewed as highly desirable. Further information regarding the Air Force Research Laboratory may be viewed at http://www.afrl.af.mil/.

E. Only contracting or grants officers are legally authorized to bind the government.

F. Proposals are encouraged from Historically Black Colleges and Universities (as determined by the Secretary of Education to meet requirements of 34 CFR Section 608.2) and from Minority Institutions (as defined by 10 U.S.C. 2323 (a) (1) (C)), either individually or as members of proposing consortia. However, no funds are specifically allocated for HBCU/MI participation.

G. Unnecessarily elaborate brochures or presentations beyond those sufficient to present a complete and effective proposal are not desired.

H. This document will guide proposers and facilitate their preparation of research proposals in AFOSR BAA 2001-5, AFOSR 2001 Theme - BIO-INSPIRED CONCEPTS. It, and other AFOSR documents, are available on the AFOSR website at http://www.afosr.af.mil or http://afosr.sciencewise.com/.

H. Central Contractor Registration

1. Definitions.

(a) Central Contractor Registration (CCR) database means the primary DoD repository for information required for the conduct of business with DoD.

(b) Data Universal Numbering System (DUNS) number means the 9-digit number assigned by Dun and Bradstreet Information Services to identify unique business entities.

(c) Data Universal Numbering System +4 (DUNS+4) number means the DUNS number assigned by Dun and Bradstreet plus a 4-digit suffix that may be assigned by a parent (controlling) business concern. This 4-digit suffix may be assigned at the discretion of the parent business concern for such purposes as identifying subunits or affiliates of the parent business concern.

(d) Registered in the CCR database means that all mandatory information, including the DUNS number or the DUNS+4 number, if applicable, and the corresponding Commercial and Government Entity (CAGE) code, is in the CCR database; the DUNS number and the CAGE code have been validated; and all edits have been successfully completed.

2. (a) By submission of an offer, the offeror acknowledges the requirement that a prospective awardee must be registered in the CCR database prior to award, during performance, and through final payment of any award resulting from this solicitation, except for awards to foreign vendors for work to be performed outside the United States.

(b) The offeror shall provide its DUNS or, if applicable, its DUNS+4 number with its offer, which will be used by the contracting or grants officer to verify that the offeror is registered in the CCR database.

(c) Lack of registration in the CCR database will make an offeror ineligible for award.

(d) DoD has established a goal of registering an applicant in the CCR database within 48 hours after receipt of a complete and accurate application via the Internet. However, registration of an applicant submitting an application through a method other than the Internet may take up to 30 days. Therefore, offerors that are not registered should consider applying for registration immediately upon receipt of this solicitation.

3. The offeror is responsible for the accuracy and completeness of the data within the CCR, and for any liability resulting from the Government's reliance on inaccurate or incomplete data. To remain registered in the CCR database after the initial registration, the offeror is required to confirm on an annual basis that its information in the CCR database is accurate and complete.

4. Offerors may obtain information on registration and annual confirmation requirements by calling 1-888-227-2423, or via the Internet at www.ccr2000.com.

L. Responses should reference Broad Agency Announcement AFOSR 2001- 5, BIO-INSPIRED CONCEPTS

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COVER PAGE FOR PROPOSAL

SUBMIT COPIES OF PROPOSAL TO:	For Consideration by AFOSR Organization Unit(s)	For AFOSR Use Only
AFOSR 801 North Randolph Street Room 732 Arlington VA 22203-1977	(Indicate the most specific unit known, i.e. program, division, etc.) ☐ Aerospace & Materials Sciences ☐ Mathematical & Space Sciences ☐ Physics & Electronics ☐ Chemistry & Life Sciences ☐ Other (Specify)	**AFOSR Proposal Number** Date Received / Number of Copies / Division Assigned

Theme Area	Data Universal Numbering System Number (DUNS)	Is This Proposal Being Submitted to Another Federal Agency?
AFOSR BAA 2001-5, BIO-INSPIRED CONCEPTS		YES ☐ NO ☐ If YES, List the Agency or Agencies.

Name of Organization to Which Award Should be Made:	Administrative Address of Organization, Including Zip Code:
Institutional Code (If known)	

Is Submitting Organization: ☐ Large Business ☐ Small Business ☐ Disadvantaged Business ☐ Woman-Owned Business

☐ Educational Institution ☐ Historically Black College or University (HBCU) ☐ Minority Institution (MI) ☐ Other Non-Profit

Branch/Campus/Other Component (Where work is performed, if different)	Institutional Code (If known)

Title of Proposed Project	Type of Award Requested:
	☐ GRANT ☐ NEW ☐ CONTRACT ☐ RENEWAL ☐ AGREEMENT ☐ Other (Specify)

Requested Amount	Proposed Duration (1-60 months)	Requested Start Date	Proposal Valid Unit:
$	months		(minimum of 6 months)

Check Appropriate Box(es) If This Proposal Includes Any of the Items Listed Below:

☐ Vertebrate Animals ☐ National Environmental Policy Act ☐ Proprietary and Privileged Information
☐ Human Subjects ☐ Historical Places ☐ Group Proposals

PI/PD Department	PI/PD Postal Address

Typed Names & Signatures	Telephone Number	Facsimile Number	Electronic Mail
PI/PD			
Co-PI/PD			
Administrative Representative Authorized to Conduct Negotiations:			
Primary:	( ) -	( ) -	
Alternate:	( ) -	( ) -	

CERTIFICATIONS: (Not applicable to Contracts) By signing and submitting this proposal, the proposer is providing the certification at Appendix A to 32 CFR Part 25 regarding debarment, suspension, and other matters; the certification at Appendix C to 32 CFR Part 25 regarding drug-free workplace; and the certification at Appendix A to 32 CFR Part 28 regarding lobbying.

Authorized Representative Title:	Date Signed:
Typed Name:	Signature: